

CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES WESTERN ALLEGHENY PLATEAU (SUBREGION 1)



This region's forests will be affected by a changing climate and other stressors during this century. A team of managers and researchers created an assessment that describes the vulnerability of forests in the region ([Butler-Leopold et al. 2018](#)). This report includes information on observed and future climate trends, and also summarizes key vulnerabilities for forested natural communities. The Landscape Change Research Group recently updated the Climate Change Tree

Atlas, and this handout summarizes that information. Full Tree Atlas results are available online at www.fs.fed.us/nrs/atlas/. Two climate scenarios are presented to "bracket" a range of possible futures. These future climate projections (2070 to 2099) provide information about how individual tree species may respond to a changing climate. Results for "low" and "high" emissions scenarios can be compared on the reverse side of this handout.

The updated Tree Atlas presents additional information helpful to interpret tree species changes:

- **Suitable habitat** - calculated based on 39 variables that explain where optimum conditions exist for a species, including soils, landforms, and climate variables.
- **Adaptability** - based on life-history traits that might increase or decrease tolerance of expected changes, such as the ability to withstand different forms of disturbance.
- **Capability** - a rating of the species' ability to cope or persist with climate change in this region based on suitable habitat change (statistical modeling), adaptability (literature review and expert opinion), and abundance (FIA data). The capability rating is modified by abundance information; ratings are downgraded for rare species and upgraded for abundant species.
- **Migration Potential Model** - when combined with habitat suitability, an estimate of a species' colonization likelihood for new habitats. This rating can be helpful for assisted migration or focused management (see the table section: "New Habitat with Migration Potential").

Remember that models are just tools, and they're not perfect. Model projections can't account for all factors that influence future species success. If a species is rare or confined to a small area, model results may be less reliable. These factors, and others, could cause a particular species to perform better or worse than a model projects. Human choices will also continue to influence forest distribution, especially for tree species that are projected to increase. Planting programs may assist the movement of future-adapted species, but this will depend on management decisions. Despite these limits, models provide useful information about future expectations. It's perhaps best to think of these projections as indicators of possibility and potential change.

SOURCE: This handout summarizes the full model results for the Mid-Atlantic region, available at www.fs.fed.us/nrs/atlas/combined/resources/summaries. More information on vulnerability and adaptation in the Mid-Atlantic region can be found at www.forestadaptation.org/mid-atlantic. A full description of the models and variables are provided in Iverson et al. 2019 (www.nrs.fs.fed.us/pubs/57857 and www.nrs.fs.fed.us/pubs/59105) and Peters et al. 2019 (www.nrs.fs.fed.us/pubs/58353).

CLIMATE CHANGE CAPABILITY

POOR CAPABILITY

American holly	Pin cherry
Balsam poplar	Pin oak
Bigtooth aspen	Pitch pine
Black ash	Quaking aspen
Black maple	Red pine
Black willow	Serviceberry
Bur oak	Shingle oak
Cucumbertree	Striped maple
Eastern hemlock	Swamp white oak
Eastern white pine	Sweet birch
Flowering dogwood	White spruce
Jack pine	Yellow birch
Paper birch	

FAIR CAPABILITY

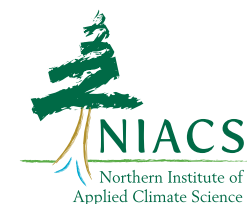
American beech	Sycamore
Boxelder	White ash
Scarlet oak	

GOOD CAPABILITY

American basswood	Northern red oak
American elm	Pignut hickory
Bitternut hickory	Red maple
Black locust	Sassafras
Black oak	Shagbark hickory
Black walnut	Slippery elm
Blackgum	Sourwood
Chestnut oak	Sugar maple
Chinkapin oak	Sweetgum
Eastern hophornbeam	Virginia pine
Hackberry	White oak
Mockernut hickory	Yellow-poplar

NEW HABITAT WITH MIGRATION POTENTIAL

Blackjack oak	Post oak
Common persimmon	Shortleaf pine
Eastern redcedar	Shumard oak
Florida maple	Southern red oak
Loblolly pine	Winged elm



ADAPTABILITY: Life-history factors, such as the ability to respond favorably to disturbance, that are not included in the Tree Atlas model and may make a species more or less able to adapt to future stressors.

- + **HIGH** Species may perform better than modeled
- **MEDIUM**
- **LOW** Species may perform worse than modeled

HABITAT CHANGE: Projected change in suitable habitat between current and potential future conditions.

- ▲ **INCREASE** Projected increase of >20% by 2100
- **NO CHANGE** Projected change of <20% by 2100
- ▼ **DECREASE** Projected decrease of >20% by 2100
- ★ **NEW HABITAT** Tree Atlas projects new habitat for species not currently present

ABUNDANCE: Based on Forest Inventory Analysis (FIA) summed Importance Value data, calibrated to a standard geographic area.

- + **ABUNDANT**
- **COMMON**
- **RARE**

CAPABILITY: An overall rating that describes a species' ability to cope or persist with climate change based on suitable habitat change class (statistical modeling), adaptability (literature review and expert opinion), and abundance within this region.

- ▲ **GOOD** Increasing suitable habitat, medium or high adaptability, and common or abundant
- **FAIR** Mixed combinations, such as a rare species with increasing suitable habitat and medium adaptability
- ▼ **POOR** Decreasing suitable habitat, medium or low adaptability, and uncommon or rare

SPECIES	LOW CLIMATE CHANGE (RCP 4.5)		HIGH CLIMATE CHANGE (RCP 8.5)		SPECIES	LOW CLIMATE CHANGE (RCP 4.5)		HIGH CLIMATE CHANGE (RCP 8.5)	
	ADAPT	ABUN	HABITAT CHANGE	CAPABILITY		ADAPT	ABUN	HABITAT CHANGE	CAPABILITY
American basswood	•	•	▲	▲	Osage-orange	+	-	▼	▼
American beech	•	•	●	○	Paper birch	•	-	▼	▼
American elm	•	•	●	○	Pignut hickory	•	-	▲	▲
American holly	•	-	▼	▼	Pin cherry*	•	-	▼	▼
American hornbeam*	•	•	▼	▼	Pin oak*	-	-	●	▼
Balsam poplar	•	-	▼	▼	Pitch pine	•	-	▼	▼
Bigtooth aspen	•	•	▼	▼	Post oak	+		★	★
Bitternut hickory*	+	•	▲	▲	Quaking aspen	•	•	▼	▼
Black ash	-	-	▼	▼	Red maple	+	+	▼	▲
Black cherry	-	+	▼	○	Red pine	-	-	▼	▼
Black locust*	•	•	●	○	Sassafras*	•	•	▲	▲
Black maple*	+	-	▼	▼	Scarlet oak	•	•	●	○
Black oak	•	•	▲	▲	Serviceberry*	•	-	▼	▼
Black walnut*	•	•	▲	▲	Shagbark hickory	•	•	▲	▲
Black willow*	-	•	▼	▼	Shingle oak	•	-	▼	▼
Blackgum	+	•	▲	▲	Shortleaf pine	•		★	★
Blackjack oak	+		★	★	Shumard oak*	+		★	★
Boxelder*	+	-	●	○	Silver maple*	+	-	▼	▼
Bur oak	+	-	▼	▼	Slippery elm*	•	•	●	○
Chestnut oak	+	•	▲	▲	Sourwood	+	-	▲	▲
Chinkapin oak	•	-	▲	▲	Southern red oak	+		★	★
Common persimmon*	+		★	★	Striped maple	•	-	▼	▼
Cucumbertree*	•	-	▼	▼	Sugar maple	+	+	●	▲
Eastern hemlock	-	•	▼	▼	Swamp white oak*	•	-	▼	▼
Eastern hophornbeam*	+	•	●	▲	Sweet birch	-	•	▼	▼
Eastern redcedar	•		★	★	Sweetgum	•	-	▲	▲
Eastern white pine	-	•	●	▼	Sycamore*	•	-	▲	○
Florida maple*	+		★	★	Virginia pine	•	-	▲	▲
Flowering dogwood	•	-	●	▼	White ash	-	+	●	○
Green ash*	•	-	●	▲	White oak	+	•	▲	▲
Hackberry	+	-	▲	▲	White spruce	•	-	▼	▼
Jack pine	+	-	▼	▼	Winged elm	•		★	★
Loblolly pine	•		★	★	Yellow birch	•	•	▼	▼
Mockernut hickory	+	-	▲	▲	Yellow-poplar	+	•	▲	▲
Northern red oak	+	+	●	▲					

*Species with low model reliability based on five statistical metrics of the habitat models that affect change class. See maps and tables for more information (www.fs.fed.us/nrs/atlas/combined/resources/summaries).